

WHAT IS CLAIMED IS:

Sub A11

1. A digital subscriber line (xDSL) communications device comprising:

5 a digital engine operable to assign bits of data for transmission in an allocated bandwidth;

a line driver operable to provide power across an effective power spectrum for transmitting the data;

a memory storing provisioned parameters for an xDSL link; and

10 a controller operable to:

determine trained parameters of the xDSL link, wherein the trained parameters comprise an available bandwidth;

15 allocate a portion of the available bandwidth as the allocated bandwidth based on the provisioned parameters; and

adjust the effective power spectrum to correspond with the allocated bandwidth.

20 2. The communications device of Claim 1, wherein the line comprises a twisted pair line forming a local loop coupled to customer premises equipment.

25 3. The communications device of Claim 1, wherein: the trained parameters comprise an upstream frequency bandwidth, an upstream margin, a downstream frequency bandwidth, and a downstream margin; and

the available bandwidth comprises the downstream frequency bandwidth.

30

4. The communications device of Claim 1, wherein:
the xDSL communications protocol comprises a discrete
multi-tone (DMT) protocol;

5 the digital engine assigns bits of data to a plurality
of low frequency bins; and

the allocated bandwidth comprises a frequency range
corresponding to the low frequency bins, wherein the low
frequency bins provide data throughput equal to or greater
than the provisioned parameters.

10 5. The communications device of Claim 1, wherein:
the xDSL communications protocol comprises a
carrierless amplitude and phase modulation (CAP) protocol;
and

15 the allocated bandwidth comprises a baud rate
providing data throughput equal to or greater than the
provisioned parameters.

20 6. The communications device of Claim 1, wherein the
controller adjusts the effective power spectrum by reducing
a frequency cutoff of the line driver.

Sub A17

5 7. The communications device of Claim 1, wherein the line driver comprises an amplifier having a feedback loop with a variable complex impedance, and the controller adjusts a real and an imaginary portion of the complex impedance to adjust the effective power spectrum.

10 8. The communications device of Claim 1, wherein the controller adjusts the effective power spectrum to correspond with the allocated bandwidth by selecting an alternative voltage supply level for the line driver.

15 9. The communications device of Claim 1, wherein the controller is further operable to:
detect a period of reduced activity, wherein a required bandwidth during the period of inactivity is less than the allocated bandwidth;
reduce the allocated bandwidth; and
adjust the effective power spectrum to correspond with the reduced allocated bandwidth.

20

10. A method for reducing power consumption on a digital subscriber line (xDSL) link, comprising:

training the xDSL link;

5 determining trained parameters of the xDSL link, wherein the trained parameters comprise an available bandwidth;

determining provisioned parameters of the xDSL link;

10 allocating a portion of the available bandwidth for xDSL communications based on the provisioned parameters; and

adjusting analog characteristics of a line driver to correspond with the allocated portion of the available bandwidth.

15 11. The method of Claim 10, wherein the available bandwidth comprises a downstream frequency bandwidth.

20 12. The method of Claim 10, wherein the allocated portion of the available bandwidth comprises a low frequency portion of the available bandwidth.

25 13. The method of Claim 10, wherein the allocated portion of the available bandwidth comprises low frequency bins of the available bandwidth for communicating data using a discrete multi-tone (DMT) communications protocol.

Sub A17

5 14. The method of Claim 10, wherein the allocated portion of the available bandwidth comprises an assigned baud rate for communicating data using a carrierless amplitude and phase modulation (CAP) protocol, wherein the assigned baud rate is less than a maximum available baud rate given the available bandwidth.

10 15. The method of Claim 10, wherein adjusting the analog characteristics of the line driver comprises reducing a frequency cutoff of the line driver to correspond to a high end frequency of the allocated portion of the available bandwidth.

15 16. The method of Claim 10, wherein adjusting analog characteristics of the line driver comprises adjusting a real and an imaginary portion of a variable complex impedance feedback loop of the line driver.

20 17. The method of Claim 10, wherein adjusting analog characteristics of the line driver comprises selecting an alternative voltage supply level for the line driver.

18. Software for reducing power consumption on a digital subscriber line (xDSL) link, the software embodied on a computer readable medium and operable to:

5 determine trained parameters of the xDSL link, wherein the trained parameters comprise an available bandwidth;
determine provisioned parameters of the xDSL link;
allocate a portion of the available bandwidth for xDSL communications based on the provisioned parameters; and
10 adjust analog characteristics of a line driver to correspond with the allocated portion of the available bandwidth.

19. The software of Claim 18, wherein the available bandwidth comprises a downstream frequency bandwidth.

20. The software of Claim 18, wherein the allocated portion of the available bandwidth comprises a low frequency portion of the available bandwidth.

20 *sub A17* 21. The software of Claim 18, wherein the allocated portion of the available bandwidth comprises low frequency bins of the available bandwidth for communicating data using a discrete multi-tone (DMT) communications protocol.

25 22. The software of Claim 18, wherein the allocated portion of the available bandwidth comprises an assigned baud rate for communicating data using a carrierless amplitude and phase modulation (CAP) protocol, wherein the assigned baud rate is less than a maximum available baud
30 rate given the available bandwidth.

5 23. The software of Claim 18, further operable to adjust the analog characteristics of the line driver by reducing a frequency cutoff of the line driver to correspond to a high end frequency of the allocated portion of the available bandwidth.

10 24. The software of Claim 18, further operable to adjust the analog characteristics of the line driver by adjusting a real and an imaginary portion of a variable complex impedance feedback loop of the line driver.

15 25. The software of Claim 18, further operable to adjust the analog characteristics of the line driver by selecting an alternative voltage supply level for the line driver.

26. A digital subscriber line (xDSL) communications device comprising:

means for training the xDSL link;

5 means for determining trained parameters of the xDSL link, wherein the trained parameters comprise an available bandwidth;

means for determining provisioned parameters of the xDSL link;

10 means for allocating a portion of the available bandwidth for xDSL communications based on the provisioned parameters; and

means for adjusting analog characteristics of a line driver to correspond with the allocated portion of the available bandwidth.

15

27. The communications device of Claim 26, wherein the available bandwidth comprises a downstream frequency bandwidth.

20

28. The communications device of Claim 26, wherein the allocated portion of the available bandwidth comprises a low frequency portion of the available bandwidth.

25

Sub A17
29. The communications device of Claim 26, wherein the allocated portion of the available bandwidth comprises low frequency bins of the available bandwidth for communicating data using a discrete multi-tone (DMT) communications protocol.

30

5 30. The communications device of Claim 26, wherein
the allocated portion of the available bandwidth comprises
an assigned baud rate for communicating data using a
carrierless amplitude and phase modulation (CAP) protocol,
wherein the assigned baud rate is less than a maximum
available baud rate given the available bandwidth.

10 31. The communications device of Claim 26, wherein
the means for adjusting the analog characteristics of the
line driver comprises means for reducing a frequency cutoff
of the line driver to correspond to a high end frequency of
the allocated portion of the available bandwidth.

15 32. The communications device of Claim 26, wherein
the means for adjusting analog characteristics of the line
driver comprises means for adjusting a real and an
imaginary portion of a variable complex impedance feedback
loop of the line driver.

20 33. The communications device of Claim 26, wherein
the means for adjusting analog characteristics of the line
driver comprises means for selecting an alternative voltage
supply level for the line driver.

25